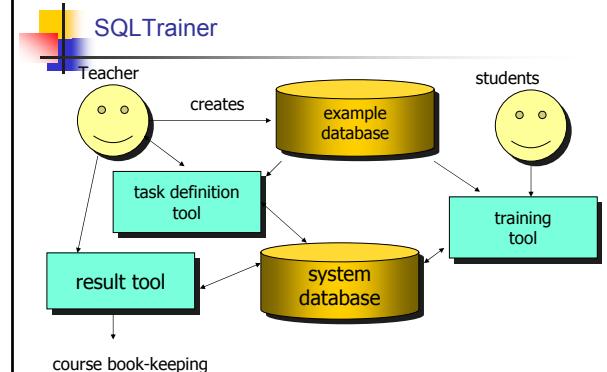


## SQLTrainer

- A Web based tool for practicing database operations
- 1999 -
- Course: Introduction to Databases
- 200 + 350 + 50 students yearly
- used in normal lecture courses and in an e-learning course



## SQLTrainer

- Tasks specify problems to be solved as SQL-queries
- The queries produce results
- There may be many correct queries for a problem
- There may also be many correct results for a problem
- Many queries provide the same result
- The query need not be correct even if it provides a correct result

## SQLTrainer

- In SQLTrainer the correctness of the query is defined by properties that describe both the query and the result – a rather small amount of properties is enough
- The properties of the result include
  - the number of rows
  - the maximum number of columns
  - columns that must be included
  - checksum over some column
  - unacceptable redundancy among columns
  - acceptance of duplicate rows
  - number of rows if duplicates are included

## SQLTrainer

- Properties of the query include
  - tables that must be used
  - tables that should not be used
  - ordering criteria
  - string that has to be included
  - a correct example query (not necessary)

## SQLTrainer

- SQLTrainer supports multiple simultaneous courses (lecture course, e-learning course). The same tasks may be used in many courses with different deadlines.
- The task definition tool has two modes
  - the teacher may specify the properties manually
  - the tool makes a proposal of property values automatically based on the example query



## SQLTrainer

- Training

- The number of tries is not limited
- All answers are stored in the database
- A previous answer (to whatever query) may be used as the basis for a new answer
- Student status shows which tasks are solved and how many tries there has been
- Finnish/English user interface



## SQLTrainer

- Training

- Analysis:
  - pre-execution analysis to prevent some operations and to prepare the query for execution
  - compilation and execution (dbms)
  - post execution analysis of the result
  - post execution analysis of the query
- Feedback
  - syntax feedback by dbms compiler
  - semantic feedback provides hints of how to correct the query



## SQLTrainer

- Positive even enthusiastic feedback about the tool
- 200 students and 36 tasks result in about 45000 registered answers within 3 weeks (analysis?)
- Over 60 percent of students succeed in solving enough tasks to receive maximum points
- SQL-skills in exams seem to be better than before



## SQLTrainer

- Problems found:

- Some answers might be judged as correct even if they are not (this is true especially for problems with a single result row)
- some students tend to try and re-try repeatedly without thinking between
- The current Oracle dbms provides poor feedback about syntax errors (previous Solid was better)
- Pre-analysis should be improved to prevent large results (missing join conditions)



## SQLTrainer

- Current and future development

- Support for other task types than SQL-queries
  - update operations (currently in field testing phase)
    - *updates do not change the original tables but student specific copy rows*
  - relational algebra
    - *first prototype provided a good user interface but failed in transforming the algebra operations in SQL*
- Architectural changes. There will be a general framework that stores the answers and shows the status of students. Each task type has dynamically loadable analyser and presenter classes that will be activated by the framework. To introduce a new task type one has to program the analyser and presenter and register them.